

Fertility Model and Female Labour Force Participation in Selected ASEAN Countries

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Abstract—This paper tends to investigate the ambiguous relationship between fertility and women's labour force participation in the case of Malaysia and other selected Asian countries such as Singapore, Thailand, Indonesia, the Philippines and Vietnam. Using a panel of observations for the period 1995 to 2009, this study examines the correlation and panel causality effect between fertility rate, female labour force participation, and other fertility factors. The panel analysis was done on the six selected ASEAN countries (ASEAN-6), as well as for each of the individual country. This study found that there is mixed correlation between the regression variables in ASEAN countries but none of them have a strong correlation. The results on causality tests show that primary education, health expenditure, life expectancy at birth, labour participation rate, and self-employed - female do not granger-cause fertility rate in all six ASEAN countries. However there is a unidirectional causality which runs from fertility rate to education primary, life expectancy at birth and labour participation rate.

Index Terms—Fertility rate, female labor force participation, correlation, panel causality test, ASEAN countries.

I. INTRODUCTION

Many studies have been carried out to analyze the relationship between fertility and female labor force participation. Several researchers have recently observed an aggregate reversal in the cross-country correlation between the total fertility rate (TFR) and the female labor force participation rate (FLFP) among countries.

Countries with the lowest fertility rates are those with relatively low rates of female labour force participation. And the other way around, countries with higher fertility rate tend to have relatively high female labour force participation rates.

It is observed that the correlation between TFR and FLFP across developed countries was negative and strongly significant during the 1970s and up to the early 1980s. Conversely, by the late 1980s the correlation had become positive and equally significant. As suggested by few researchers, the link between female employment and fertility is weak due to a greater availability of market child care and the rising income effect of wages at high levels of

female wage [1]-[3].

However, several authors stated that changes in the sign of the cross-country correlation between TFR and FLFP have often been mistakenly associated with a change in the time series association between TFR and FLFP [4]-[5], and [6]. Another study shows that neither the causality nor the time series association between TFR and FLP has changed over time [7].

Based on recent trend in developed and OECD countries, this paper tends to examine the ambiguous relationship between fertility and women's labour force participation in the case of Malaysia and other selected Asian countries such as Singapore, Thailand, Indonesia, the Philippines and Vietnam.

II. REVIEW OF LITERATURE

Fertility is significantly important in macroeconomics performance [8], especially in debates on labour force participation of women. One of the early studies using the method-related reasons for the U.S. data for the year 1948-93 has been found that there was no one-way relationship between fertility and female labour force participation [9].

Most studies on labour force participation of women and fertility include the importance of education [10] and [11]. One recent study suggested that the effect of falling fertility on labour supply can be offset by changes in related behaviour [12]. In other word, a fertility decline induces higher education and health investments.

In examining causality and parameter instability in the long-run relation between fertility and female employment by applying error correction model, causality is found in both directions [7]. A negative correlation between women's employment and fertility was found in [13]-[16].

As the female schooling goes up to higher levels, it directly lowers fertility rate and raises female activity rates. Therefore, female labour force can be increased in the society either by reducing fertility and unemployment rates or by increasing their educational attainment [18]

When most literature generally points to a negative relationship between female education and fertility, policymakers have advocated educating girls and young women as a means to reduce population growth and foster sustained economic and social welfare in developing countries. In Nigeria, the impact of education on fertility is estimated and concluded that increasing female education by one year reduces early fertility by 0.26 births [19]. Women, working in either sector of the labour market significantly reduce fertility but, unlike many previous studies, fertility has a positive impact on the probability of labour force

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participation of women [20].

TABLE I: PEARSON CORRELATION FOR ASEAN-6

	<i>Fr</i>	<i>he</i>	<i>Ep</i>	<i>le</i>	<i>Se</i>	<i>lp</i>
<i>Fr</i>	1.000	-0.497	0.366	-0.676	0.203	-0.581
<i>He</i>	-0.497	1.000	0.140	0.888	-0.812	-0.120
<i>Ep</i>	0.366	0.140	1.000	-0.120	-0.231	-0.646
<i>Le</i>	-0.676	0.888	-0.120	1.000	-0.589	0.314
<i>Se</i>	0.203	-0.812	-0.231	-0.589	1.000	0.407
<i>Lp</i>	-0.581	-0.120	-0.646	0.314	0.407	1.000

TABLE II (A): GRANGER CAUSALITY BETWEEN FERTILITY RATE AND INDEPENDENT VARIABLES AMONG ASEAN-6, MALAYSIA, AND INDONESIA

Ho:	ASEAN-6	Malaysia	Indonesia
	F-Stat (p value)	F-Stat (p value)	F-Stat (p value)
<i>ep</i> does not G-Cause <i>fr</i>	1.637 (0.204)	0.636 (0.554)	4.478** (0.049)
<i>fr</i> does not G-Cause <i>ep</i>	7.182*** (0.008)	0.742 (0.506)	3.224* (0.094)
<i>he</i> does not G-Cause <i>fr</i>	0.799 (0.373)	0.696 (0.526)	0.485 (0.632)
<i>fr</i> does not G-Cause <i>he</i>	0.025 (0.873)	4.262** (0.054)	4.232** (0.055)
<i>le</i> does not G-Cause <i>fr</i>	1.589 (0.210)	11.169*** (0.004)	27.779*** (0.000)
<i>fr</i> does not G-Cause <i>le</i>	4.373** (0.015)	46.732* (0.000)	163.98*** (0.000)
<i>lp</i> does not G-Cause <i>fr</i>	2.014 (0.139)	10.608*** (0.005)	8.182** (0.011)
<i>fr</i> does not G-Cause <i>lp</i>	4.348** (0.016)	0.305 (0.744)	3.371* (0.086)
<i>se</i> does not G-Cause <i>fr</i>	0.303 (0.583)	2.990 (0.107)	4.356** (0.052)
<i>fr</i> does not G-Cause <i>se</i>	1.096 (0.298)	0.333 (0.725)	6.245** (0.023)

Note: ***, **, * indicates rejection of the null hypothesis of no-cointegration at 1%, 5%, and 10% level of significance.

III. DATA AND METHODOLOGY

The data set consists of a panel of observations for six (6) ASEAN countries namely Indonesia, Malaysia, the Philippines, Singapore and Thailand for the period 1995 to 2009. Annual data on health expenditure, life expectancy at birth, labour participation rate, education primary, and self-employed rate and fertility rate are collected from the World Development Indicator (WDI) and Asian Development Bank (ADB).

The study estimates the population Pearson correlation r between X (fertility) and Y . (health expenditure, life expectancy at birth, labour participation rate, education primary, and self-employed rate). Before the causality can be carried out, this study test on panel unit root and chose the Levin, Lin and Chu version, and Im, Pesaran and Shin which are based on the well-known Dickey-Fuller procedure [20].

TABLE II (B): GRANGER CAUSALITY BETWEEN FERTILITY RATE AND INDEPENDENT VARIABLES FOR THE PHILIPPINES, SINGAPORE, THAILAND AND VIETNAM

	Philippines	Singapore	Thailand	Vietnam
Ho:	F-Stat (p value)	F-Stat (p value)	F-Stat (p value)	F-Stat (p value)
<i>ep</i> does not Granger Cause <i>fr</i>	9.223*** (0.008)	1.757 (0.233)	6.050** (0.025)	1.286 (0.327)
<i>fr</i> does not G-Cause <i>ep</i>	2.542 (0.139)	2.101 (0.184)	2.1686 (0.176)	1.160 (0.360)
<i>he</i> does not G-Cause <i>fr</i>	4.774** (0.043)	0.588 (0.577)	9.340*** (0.008)	44.123** (0.000)
<i>fr</i> does not G-Cause <i>he</i>	5.114 (0.037)	0.350 (0.714)	3.066 (0.102)	0.720 (0.515)
<i>le</i> does not G-Cause <i>fr</i>	113.619*** (0.000)	1.695 (0.243)	14.386*** (0.002)	154.241* (0.000)
<i>fr</i> does not G-Cause <i>le</i>	95.022*** (0.000)	0.813 (0.476)	17.976*** (0.001)	445.571* (0.000)
<i>lp</i> does not G-Cause <i>fr</i>	5.893** (0.026)	0.917 (0.437)	15.010*** (0.002)	0.159 (0.855)
<i>fr</i> does not G-Cause <i>lp</i>	1.914 (0.209)	1.748 (0.234)	13.505*** (0.002)	2.5904 (0.135)
<i>se</i> does not G-Cause <i>fr</i>	6.530** (0.020)	0.333 (0.726)	4.979** (0.039)	1.627 (0.255)
<i>fr</i> does not G-Cause <i>se</i>	2.179 (0.175)	0.049 (0.952)	3.122* (0.099)	0.163 (0.851)

Note: ***, **, * indicates rejection of the null hypothesis of no-cointegration at 1%, 5%, & 10% level of significance.

IV. ANALYSIS OF DATA

This section discusses the results of this estimation for ASEAN-6, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam.

A. Pearson Correlation

Table I presents the correlation results for all the six (6) countries. There is positive and negative correlation between regression variable in ASEAN countries but none of them have a strong correlation.

The highest correlation is between health expenditure (*he*) and life expectancy at birth (*le*) with $r^2 = 79.01\%$ or $r = 0.8889$. It is a positive correlation. Then followed by the negative correlation between health expenditure (*he*) and self-employed - female (*se*) with $r = -0.8123$ which is equal to $r^2 = 65.98\%$. The rest of variables have a weak relationship.

B. Panel Causality Test

The Granger-causality test is very sensitive to the number of lags included in the regression; both the Akaike Information Criteria (AIC) have been used in order to find an appropriate number of lags. Both Table II (a) and Table II (b) report the results corresponding to different regressions.

According to Table II (a) it is found that education primary (*ep*), health expenditure (*he*), life expectancy at birth (*le*), labour participation rate (*lp*), and self-employed - female (*se*), does not granger cause fertility rate in ASEAN-6. But there is a unidirectional causality which runs from fertility rate to

education primary (*ep*), life expectancy at birth (*le*) and labour participation rate (*lp*).

As for Malaysia, this study found that life expectancy at birth (*le*) has granger causality to fertility rate at 1 percent confidence level. Means that life expectancy (*le*) and fertility rate can influence each other's. While, labour participation rate (*lp*) has directional causality to fertility rate at 1 percent confidence level.

In Indonesia, education primary (*ep*), labour participation (*lp*) and self-employed - female (*se*) have granger causality to fertility rate at 5 percent confidence level but life expectancy at birth (*le*) has granger causality to fertility at 1 percent only.

Refer to Table II (b), the entire variable that was regressed has granger causality with fertility rate (*fr*) in Philippines but the differences is the confidence level. The health expenditure (*he*) and self-employed – female (*se*) have granger causality to fertility rate at 5 percent confidence level but education primary (*ep*), life expectancy at birth (*le*) and labour participation rate (*lp*) have granger causality to fertility only at 1 percent confidence level.

As for Thailand, health expenditure (*he*), life expectancy at birth (*le*) and labour participation rate (*lp*) have granger causality to fertility rate at 1 percent of confidence level. The education primary (*ep*) and self-employed – female (*se*) have a granger causality to fertility rate at 5 percent of confidence level. There is a directional causality between variable to fertility rate in Thailand.

Vietnam also has a variable that are granger causality and directional causality to the fertility rate at 1 percent of confidence level. Health expenditure (*he*) and life expectancy at birth (*le*) have granger causality to fertility rate but life expectancy at birth (*le*) is directional causality to fertility rate. However, Singapore is the one and only nation in ASEAN that didn't show any causality between variable in regression.

V. CONCLUSION

In examining the degree of linear dependence between the variables, the results obtained from Pearson correlation show that there is a positive and negative correlation between regression variable in ASEAN countries, but none of them have a strong correlation. By employing the Granger-causality test to analyze the causal relationship between variables observed, the findings show that primary education, health expenditure, life expectancy at birth, labour participation rate, and self-employed - female, does not granger-cause fertility rate in ASEAN-6. But there is a unidirectional causality which runs from fertility rate to education level, life expectancy at birth and labour participation rate. As for an individual country, results are rather mixed. Thus, in general to reduce fertility in most of the countries, policymakers can promote more job opportunities for women.

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